D E C L A R A T I O N

I, Jiro HORIKAWA, a national of Japan, c/o Sumitomo Chemical Intellectual Property Service, Limited, 5-33, Kitahama 4-chome, Chuo-ku, Osaka-shi, Osaka 541-8550, Japan, declare that to the best of my knowledge and belief the attached is a full, true and faithful translation into English made by me of the certified copy of Japanese Patent Application No. 2003-000895 attached thereto.

Signed this 19th day of February, 2007

Jiro Horikawa

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JAPAN PATENT OFFICE

This is to certify that the annexed is a true copy of the following application as filed with this office.

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[Name of Document] Specification

[Title of the Invention] PROCESS FOR PRODUCING MODIFIED ETHYLENE-VINYLCYCLOHEXANE COPOLYMER RESIN, AND MODIFIED ETHYLENE-VINYLCYCLOHEXANE COPOLYMER RESIN

[Scope of Claim for a Patent]

[Claim 1]

A process for producing a modified ethylene-vinylcyclohexane copolymer resin, which comprises the steps of:

- blending 100 parts by weight of the following (A) with 0.1 to 20 parts by weight of the following (B) and 0.01 to 20 parts by weight of the following (C) to produce a blend, and

- melt-kneading said blend with an extruder,

(A) an ethylene-vinylcyclohexane copolymer resin,

(B) at least one compound selected from the group consisting of the following (B1) and (B2),

(B1) a compound having in its molecule (i) at least one kind of an unsaturated group, namely, a carbon-carbon double or triple bond and (ii) at least one kind of a polar group, and

(B2) a compound having in its molecule (iii) (OR) wherein R is hydrogen, an alkyl group, an aryl group, an acyl group or a carbonyldioxy group, and (iv) at least two same or different functional groups selected from a carboxylic acid, an acid halide, an acid anhydride, an acid halide anhydride, an acid ester, an acid amide, an imide, an imido, an amino and salts thereof, and

(C) an organic peroxide.

[Claim 2]

The process for producing a modified ethylene-vinylcyclohexane copolymer resin according to Claim 1, wherein (B) is maleic anhydride, maleic acid, fumaric acid, itaconic anhydride, itaconic acid, glycidyl (meth)acrylate or 2-hydroxyethylmethacrylate.

[Claim 3]

The process for producing a modified ethylene-vinylcyclohexane copolymer resin according to Claim 1 or 2, wherein the ethylene-vinylcyclohexane copolymer resin is combined with a vinyl aromatic compound.

[Claim 4]

The process for producing a modified ethylene-vinylcyclohexane copolymer resin according to any one of Claims 1 to 3, wherein the melt-kneading is carried out at a former melt-kneading temperature and at a latter melt-kneading temperature higher than the former melt-kneading temperature.

[Claim 5]

A modified ethylene-vinylcyclohexane resin produced by the process according to any one of Claims 1 to 4.

[Detailed Explanation of the Invention]

[0001]

[Technical Field to which the Invention pertains]

The present invention relates to a process for producing a modified ethylene-vinylcyclohexane copolymer resin, and a modified ethylene-vinylcyclohexane copolymer resin. More

specifically, the present invention relates to a process for producing a modified ethylene-vinylcyclohexane copolymer resin having a large graft amount, and a modified ethylene-vinylcyclohexane copolymer resin.

[0002]

[Prior Art]

An α-olefin resin is relatively-inexpensive, and is also good in its property such as moldability, a heat resistance, a solvent resistance, a mechanical property and an appearance, and therefore, said resin is molded into various articles, which are used in various fields. Further, in order to take advantage of features of said resin, said resin is blended or alloyed with different kinds of polymers, or said resin is combined with various kinds of inorganic materials to produce composite materials, or said resin is laminated with a metal, all of which are attempts to make materials having more excellent features.

[0003]

However, since an α-olefin resin does not have any polar group, there are problems in that an α-olefin resin is poor in its property such as adhesion properties, coating properties and printing properties, and in that an α-olefin resin does not have good adhesiveness to inorganic materials or metals. Also, there are problems in that an α-olefin resin has such poor compatibility with different kinds of polymers having a polar group, particularly so-called engineering plastics such as a polyester resin, a polyamide resin, a

polyphenylene sulfide resin and a polyphenylene oxide resin, that a polymer alloy of an α-olefin resin with a polar group-containing polymer is poor in its properties such as an impact resistance and mechanical properties, and therefore, an article molded from the alloy breaks away on its surface.

[0004]

In order to solve those problems, there have been proposed some methods for modifying an α-olefin resin, particularly a polyethylene resin or a polypropylene resin, and there have been carried out one method for modifying a polypropylene resin by irradiating an electron ray, a radiation ray or ozone, and another method for modifying an α-olefin resin by grafting a functional group thereon in the presence of a radical initiator such as an organic peroxide.

[0005]

Among them, generally used is a method for modifying a polyethylene resin or a polypropylene resin by grafting a functional group thereon in a molten state with an extruder. The grafting in this method needs to use an organic peroxide as an initiator, or needs to irradiate an ultraviolet ray or a radiation ray, which crosslink or decompose a part of a polyethylene or polypropylene resin. Therefore, an increase in an amount of an initiator such as an organic peroxide in order to increase a graft amount changes remarkably MFR of a modified α-olefin resin. Accordingly, there are problems in that an initiator must be added in a limited amount, which results in limiting an increase of a graft amount.

[0006]

In order to solve those problems, there are disclosed a styrene-adding method (non-patent literature 1), and a divinylbenzene-adding method (patent literature 1), which are not sufficiently satisfactory methods.

[0007]

[Patent literature 1]

JP 7-173229A

[Non-patent literature 1]

Practical Polymer Alloy Design, page 51, Industry Investigation Committees (1996) authored by Fumio IDE

[0008]

[Problem to be solved by the Invention]

Under those circumstances, the present invention provides a process for producing a modified ethylene-vinylcyclohexane copolymer resin having a large graft amount, and a modified ethylene-vinylcyclohexane copolymer resin.

[0009]

[Means to solve the Problem]

As a result of the present inventors' long-term and keen investigations, it has been found that a large graft amount can be obtained by modifying a specific ethylene-based resin among an α-olefin resin, particularly an ethylene-vinylcyclohexane copolymer resin, which has solved the above-mentioned problems.

That is, the present invention is a process for

producing a modified ethylene-vinylcyclohexane copolymer resin, which comprises the steps of:

- blending 100 parts by weight of the following (A) with 0.1 to 20 parts by weight of the following (B) and 0.01 to 20 parts by weight of the following (C) to produce a blend, and

- melt-kneading said blend with an extruder,

(A) an ethylene-vinylcyclohexane copolymer resin,

(B) at least one compound selected from the group consisting of the following (B1) and (B2),

(B1) a compound having in its molecule (i) at least one kind of an unsaturated group, namely, a carbon-carbon double or triple bond and (ii) at least one kind of a polar group, and

(B2) a compound having in its molecule (iii) (OR) wherein R is hydrogen, an alkyl group, an aryl group, an acyl group or a carbonyldioxy group, and (iv) at least two same or different functional groups selected from a carboxylic acid, an acid halide, an acid anhydride, an acid halide anhydride, an acid ester, an acid amide, an imide, an imido, an amino and salts thereof, and

(C) an organic peroxide.

[0010]

[Mode for carrying out the Invention]

The component (A) in the present invention is an ethylene-vinylcyclohexane copolymer resin. The ethylene-vinylcyclohexane copolymer resin contains vinylcyclohexane in an amount of preferably 1% by mol to 30%

by mol. When said amount is less than 1% by mol, a graft amount is too low, and when said amount is more than 30% by mol, the obtained modified ethylene-vinylcyclohexane copolymer resin remarkably adheres to each other, and its productivity is poor.

[0011]

The component (B) in the present invention is at least one compound selected from the group consisting of the following (B1) and (B2),

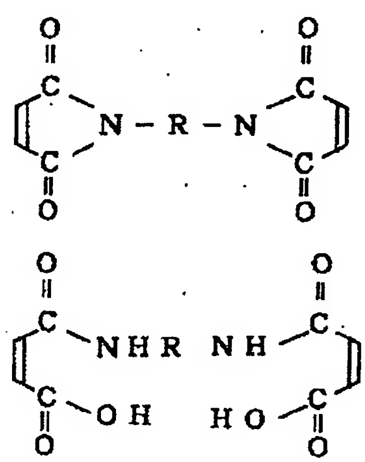
(B1) a compound having in its molecule (i) at least one kind of an unsaturated group, namely, a carbon-carbon double or triple bond and (ii) at least one kind of a polar group, and

(B2) a compound having in its molecule (iii) (OR) wherein R is hydrogen, an alkyl group, an aryl group, an acyl group or a carbonyldioxy group, and (iv) at least two same or different functional groups selected from a carboxylic acid, an acid halide, an acid anhydride, an acid halide anhydride, an acid ester, an acid amide, an imide, an imido, an amino and salts thereof.

[0012]

The compound having in its molecule (i) at least one kind of an unsaturated group, namely, a carbon-carbon double or triple bond and (ii) at least one kind of a polar group is a compound having in its molecule both an unsaturated group, namely, a carbon-carbon double or triple bond and a polar group, namely, an amide group contained in a polyamide resin, a

carboxyl group existing on a polymer chain terminal, or a functional group having compatibility or chemical reactivity with an amino group. Examples of the functional group are a carboxylic acid group; an acid salt, an ester, an acid amide, an acid anhydride, an imide, an acid azide and an acid halide, which are groups derived from a carboxylic acid, namely, groups formed by substitution of a hydrogen atom or a hydroxyl group contained in a carboxyl group; an oxazoline; a nitrile; an epoxy group; an amino group; a hydroxyl group; and a isocyanic acid ester group. As the compound having both an unsaturated group and a polar group, there is used an unsaturated carboxylic acid, a derivative thereof, an unsaturated epoxy compound, an unsaturated alcohol, an unsaturated amine or an unsaturated isocyanic acid ester. Specific examples thereof are maleic acid, maleic anhydride, fumaric acid, maleimide, maleic acid hydrazide, a reaction product of maleic anhydride with a diamine, which product is represented by the following formula, wherein R is an aliphatic group or an aromatic group,



methylnadic acid anhydride, dichloromaleic acid anhydride, maleic acid amide, itaconic acid, itaconic acid anhydride, natural oils and fats (for example, soybean oil, tung oil, castor oil, linseed oil, falx oil, cotton oil, sesame oil, rapeseed oil, peanut oil, camellia oil, olive oil, coconut oil and sardine oil), epoxidized natural oils and fats, an unsaturated carboxylic acid (for example, acrylic acid, butenoic acid, crotonic acid, vinylacetic acid, methacrylic acid, pentenoic acid, angelic acid, tiglic acid, 2-pentenoic acid, 3-pentenoic acid, α-ethylacrylic acid, β-methylcrotonic acid, 4-pentenoic acid, 2-hexene, 2-methyl-2-pentenoic acid, 3-methyl-2-pentenoic acid, α-ethylcrotonic acid, 2,2-dimethyl-3-butenoic acid, 2-heptenoic acid, 2-octenoic acid, 4-decenoic acid, 9-undecenoic acid, 10-undecenoic acid, 4-dodecenoic acid, 5-dodecenoic acid, 4-tetradecenoic acid, 9-tetradecenoic acid, 9-hexadecenoic acid, 2-octadecenoic acid, 9-octadecenoic acid, eicosenoic acid, docosenoic acid, erucic acid, tetracosenoic acid, mycolipenic acid, 2,4-hexadienoic acid, dially acetate, geranic acid, 2,4-decadienoic acid, 2,4-dodecadienoic acid, 9,12-hexadecadienoic acid, 9,12-octadecadienoic acid, hexadecatrienoic acid, eicosadienoic acid, eicosatrienoic acid, eicosatetraenoic acid, ricinoleic acid, eleostearic acid, oleic acid, eicosapentaenoic acid, erucic acid, docosadienoic acid, docosatrienoic acid, docosatetraenoic acid, docosapentaenoic acid, tetracosenoic acid, hexacosenoic acid, hexacodienoic acid, and octacosenoic acid),

unsaturated carboxylic acid esters, unsaturated carboxylic acid amides, unsaturated carboxylic acid anhydrides, unsaturated alcohols (for example, allyl alcohol, crotyl alcohol, methylvinyl carbinol, ally carbinol, methylpropenyl carbinol, 4-penten-1-ol, 10-undecen-1-ol, propargyl alcohol, 1,4-pentadien-3-ol, 1,4-hexadien-3-ol, 3,5-hexadien-2-ol, 2,4-hexadien-1-ol, alcohols represented by the formulas $C_nH2_{n-5}OH$, $C_nH_{2n-7}OH$ and $C_nH_{2n-9}OH$ (n is a positive integer), 3-buten-1,2-diol, 2,5-dimethyl-3-hexen-2,5-diol, 1,5-hexadien-3,4-diol and 2,6-octadien-4,5-diol), unsaturated amines obtained by replacing an OH group in unsaturated alcohols with an $-NH_2$ group, glycidyl (meth)acrylate, and ally glycidyl ether. Further examples thereof are products obtained by adding maleic anhydride or phenols to low molecular weight polymers of butadiene or isoprene (for example, those having an average molecular weight of 500 to 10000) or high molecular weight polymers thereof (for example, those having an average molecular weight of not less than 10000), products obtained by introducing an amino group, a carboxyl group, a hydroxyl group or an epoxy group thereto, and ally isocyanate.

[0013]

In the present invention, it goes without saying that the definition of the compound having in its molecule both an unsaturated group and a polar group also contains a compound having two or more unsaturated groups, which are the same as or different from one another, and two or more polar groups,

which are the same as or different from one another. The compound having in its molecule both an unsaturated group and a polar group may be a combination of two or more kinds of specific compounds. Among them, preferred is maleic anhydride, maleic acid, fumaric acid, itaconic anhydride, itaconic acid, glycidyl (meth)acrylate or 2-hydroxyethylmethacrylate.

[0014]

The compound having in its molecule (iii) (OR) (R is hydrogen, an alkyl group, an aryl group, an acyl group or a carbonyldioxy group), and (iv) at least two same or different functional groups selected from a carboxylic acid, an acid halide, an acid anhydride, an acid halide anhydride, an acid ester, an acid amide, an imide, an imido, an amino and salts thereof is an aliphatic polycarboxylic acid, an acid ester or an acid amide, and a saturated aliphatic polycarboxylic acid represented by the general formula $(R_1O)_mR(COOR_2)_n(CONR_3R_4)_1$ (in the formula, R is a linear or branched saturated aliphatic hydrocarbon group having 2 to 20 carbon atoms, and preferably 2 to 10 carbon atoms; R_1 is hydrogen, an alkyl group, an aryl group, an acyl group or a carbonyldioxy group, and particularly preferably hydrogen; R_2 is hydrogen, an alkyl group or an aryl group having 1 to 20 carbon atoms, and preferably 1 to 10 carbon atoms; R_3 and R_4 is hydrogen, an alkyl group or an aryl group having 1 to 10 carbon atoms, preferably 1 to 6 carbon atoms, and further preferably 1 to 4 carbon atoms; m is 1; n + 1 is an integer of not less than 2, and preferably 2 or 3; n is an integer of not less than 0; 1 is an integer of not less than

0; (R_1O) is positioned at an α-position or a β-position for the carbonyl group; and 2 to 6 carbon atoms exist between at least two carbonyl groups), and its derivatives. (Specifically, there can be exemplified an ester compound of a saturated aliphatic polycarboxylic acid, an amide compound thereof, an anhydride thereof, a hydrate thereof and a salt thereof. Examples of the saturated aliphatic polycarboxylic acid are citric acid, malic acid and agaricic acid. These compounds are disclosed in detail in JP-W-61-502195.)

[0015]

The component (B) is added in an amount of 0.1 to 20 parts by weight, and preferably 0.5 to 10 parts by weight per 100 parts by weight of the ethylene-vinylcyclohexane copolymer resin (A). When said amount is too small, a graft amount to the ethylene-vinylcyclohexane copolymer resin is low, and therefore, enough adhesive strength cannot be obtained. When said amount is too high, the obtained modified ethylene-vinylcyclohexane copolymer resin contains a large amount of the component (B) remaining unreacted, and therefore, enough adhesive strength cannot be obtained.

[0016]

The compound (C) in the present invention is an organic peroxide, and is preferably an organic peroxide having a decomposition temperature of 50 to 210℃, at which temperature a half-life thereof is 1 minute. When said decomposition temperature is too low, a graft amount is low, and when said decomposition temperature is too high, decomposition of the

resin is promoted. The organic peroxide is preferably an organic peroxide which decomposes to generate a radical abstracting a proton from a propylene-based resin.

[0017]

Examples of the organic peroxide having a decomposition temperature of 50 to 210℃, at which temperature a half-life thereof is 1 minute, are diacyl peroxide compounds, dialkyl peroxide compounds, peroxyketal compounds, alkylperester compounds and percarbonate compounds. Specific examples thereof are dicetyl peroxydicarbonate, di-3-methoxybutyl peroxydicarbonate, di-2-ethylhexyl peroxydicarbonate, bis(4-t-butylcyclohexyl) peroxydicarbonate, diisopropyl peroxydicarbonate, t-butyl peroxyisopropylcarbonate, dimyristyl peroxycarbonate, 1,1,3,3-tetramethylbutyl neodecanoate, α -cumyl peroxyneodecanoate, t-butyl peroxyneodecanoate, 1,1-bis(t-butylperoxy)cyclohexane, 2,2-bis(4,4-di-t-butylperoxycyclohexyl)propane, 1,1-bis(t-butylperoxy)cyclododecane, t-hexylperoxyisopropyl monocarbonate, t-butylperoxy-3,5,5-trimethyl hexanoate, t-butylperoxylaurate, 2,5-dimethyl-2,5-di(bezoylperoxy) hexane, t-butylperoxyacetate, 2,2-bis(t-butylperoxy)butene, t-butylperoxybenzoate, n-butyl-4,4-bis(t-peroxy) valerate, di-t-butylperoxyisophthalate, dicumylperoxide, α - α '-bis(t-butylperoxy-m-isopropyl)benzene, 2,5-dimethyl-2,5 -di(t-butylperoxy)hexane, 1,3-bis(t-butylperoxyisopropyl) benzene, t-butylcumylperoxide, di-t-butylperoxide, p-menthane hydroperoxide and

2,5-dimethyl-2,5-di(t-butylperoxy)hexyne-3. When the decomposition temperature is lower than 50℃, a graft amount is low, and when the decomposition temperature is higher than 210℃, a graft amount is also low. Among the above-mentioned organic peroxides, preferred are dialkyl peroxide compounds, diacyl peroxide compounds, percarbonate compounds or alkylperester compounds. The component (C) is added in an amount of 0.01 to 20 parts by weight, and preferably 0.05 to 10 parts by weight per 100 parts by weight of the ethylene-vinylcyclohexane copolymer resin (A).

[0018]

The ethylene-vinylcyclohexane copolymer resin in the present invention is preferably combined with a vinyl aromatic compound such as styrene and divinylbenzene, as long as the object and effect of the present invention are not largely disturbed. The vinyl aromatic compound is added in an amount of 0 to 15 parts by weight, and preferably 0 to 7 parts by weight per 100 parts by weight of the ethylene-vinylcyclohexane copolymer resin (A). The ethylene-vinylcyclohexane copolymer resin may be blended with a material such as antioxidants, heat stabilizers and neutralizers known in the art and generally added to a polypropylene-based resin.

[0019]

The process of the present invention may employ any of various methods known in the art for mixing a resin with other resin, a solid additive or a liquid additive by melt-kneading using an extruder. A preferable example thereof is a process

comprising the steps of blending all of respective components in a lump, or separately in combination of some of them, in a blending apparatus such as a Henschel mixer, a ribbon blender and a blender to produce a homogeneous blend, and then melt-kneading the blend. Examples of a melt-kneading apparatus are those known in the art such as a Banbury mixer, a plastomil, a Brabender plastograph, a single-screw extruder and a twin-screw extruder. Particularly preferred is a method of blending sufficiently the components (A), (B) and (C) to produce a blend, supplying the blend to an inlet of a single-screw or twin-screw extruder, and melt-kneading the blend therein, in view of continuous production and improved productivity. Temperature in a melt-kneading zone of an extruder (for example, cylinder temperature of an extruder) is 50 to 300℃, and preferably 80 to 270℃. When said temperature is too low, a graft amount may be low, and when it is too high, the resin may be decomposed. A preferable extruder has a former melt-kneading zone (first-half melt-kneading zone) and a latter melt-kneading zone (second-half melt-kneading zone), wherein temperature in the latter melt-kneading zone is higher than that in the former melt-kneading zone. A melt-kneading period of time is 0.1 to 30 minutes, and particularly preferably 0.5 to 5 minutes. When said period of time is too short, a graft amount may be insufficient, and when it is too long, the resin may be decomposed.

[0020]

[Example]

The present invention is explained with reference to the following Examples, which are only examples and do not limit the scope of the present invention, as long as they are within the scope of the present invention.

[0021]

[Method for preparing sample for evaluation]

In order to prepare a sample for evaluation in Examples and Comparative Examples, there was used a twin-screw extruder, 2D25-S (L/D = 25, cylinder diameter = 20 mm), manufactured by Toyo Seiki Co., Ltd., whose cylinder temperature was adjusted to 250℃ and screw rotating speed was 70 rpm.

[0022]

An evaluation method employed in Examples and Comparative Examples is shown as follows:

(1) Graft amount of maleic acid

There was dissolved 1.0 gram of a sample in 20 ml of xylene. The obtained solution was added dropwise to 300 ml of methanol under stirring to re-precipitate and recover the sample. The recovered sample was dried in vacuo at 80℃ for 8 hours, and then, the dried sample was hot-pressed to form a film having a thickness of 100 μm. An infrared absorption spectrum of the film was measured, thereby determining a graft amount of maleic acid based on the absorption near 1780 cm^{-1}.

[0023]

Example 1

There were added 1.0 part by weight of maleic anhydride, 3.0 parts by weight of styrene, 0.12 part by weight of

1,3-bis(t-butylperoxyisopropyl)benzene, 0.45 part by weight of dicetyl peroxydicarbonate, 0.05 part by weight of calcium stearate and 0.3 part by weight of tetraxis[methylene-3-(3,5-di-t-butyl-4-hydroxyphenyl) propionate]methane (antioxidant) to 100 parts by weight of an ethylene-vinylcyclohexane copolymer resin A having MFR (150℃, 2.16 kgf) of 34 and a vinylcyclohexane content of 16 mol%. They were sufficiently blended. The obtained blend was supplied to an inlet of the twin-screw extruder, and was melt-kneaded, thereby obtaining a sample. The extruder had a former melt-kneading zone and a latter melt-kneading zone, wherein temperature in the former melt-kneading zone was 180℃, and temperature in the latter melt-kneading zone was 260℃.

[0024]

Example 2

Example 1 was repeated except that the ethylene-vinylcyclohexane copolymer resin A was changed to an ethylene-vinylcyclohexane copolymer resin B having MFR (150℃, 2.16 kgf) of 87, and a vinylcyclohexane content of 16 mol%.

[0025]

Comparative Example 1

Example 1 was repeated except that the ethylene-vinylcyclohexane copolymer resin A was changed to a polypropylene resin A having MFR (230℃, 2.16 kgf) of 0.1.

[0026]

Comparative Example 2

Example 1 was repeated except that the

ethylene-vinylcyclohexane copolymer resin A was changed to a polyethylene resin A having MFR (190℃, 2.16 kgf) of 8.

[0027]

[Table 1]

	Example		Comparative Example	
	1	2	1	2
Blending (parts by weight)				
(A)Ethylene-vinylcyclohexane copolymer resin A	100			
Ethylene-vinylcyclohexane copolymer resin B		100		
Polypropylene resin A			100	
Polyethylene resin A				100
(B)Maleic anhydride	3.0	3.0	3.0	3.0
(C)Organic peroxide A	0.12	0.12	0.12	0.12
Organic peroxide B	0.45	0.45	0.45	0.45
Styrene monomer	3.0	3.0	3.0	3.0
Evaluation result				
Graft amount of maleic acid (% by weight)	2.2	2.0	1.1	1.6

Organic peroxide A: 1,3-bis(t-butylperoxyisopropyl)benzene having a decomposition temperature of 183℃, at which temperature a half-life thereof is 1 minute.

Organic peroxide B: dicetyl peroxydicarbonate having a decomposition temperature of 99℃, at which temperature a half-life thereof is 1 minute.

[0028]

[Effect of the Invention]

As explained above, the present invention provides a process for producing a modified ethylene-vinylcyclohexane copolymer resin having a large graft amount, and a modified ethylene-vinylcyclohexane copolymer resin.

[Name of Document] Abstract

[Summary]

[Subject] A process for producing a modified ethylene-vinylcyclohexane copolymer resin having a large graft amount, and a modified ethylene-vinylcyclohexane copolymer resin.

[Means for Solution] A process for producing a modified ethylene-vinylcyclohexane copolymer resin, which comprises the steps of (1) blending 100 parts by weight of the following (A) with 0.1 to 20 parts by weight of the following (B) and 0.01 to 20 parts by weight of the following (C) to produce a blend, and (2) melt-kneading said blend with an extruder: (A) an ethylene-vinylcyclohexane copolymer resin, (B) at least one compound selected from the group consisting of the following (B1) and (B2), (B1) a compound having in its molecule (i) at least one kind of an unsaturated group, namely, a carbon-carbon double or triple bond and (ii) at least one kind of a polar group, and (B2) a compound having in its molecule (iii) (OR) wherein R is hydrogen, an alkyl group, an aryl group, an acyl group or a carbonyldioxy group, and (iv) at least two same or different functional groups selected from a carboxylic acid, an acid halide, an acid anhydride, an acid halide anhydride, an acid ester, an acid amide, an imide, an imido, an amino and salts thereof, and (C) an organic peroxide.

[Selected Drawing] Nothing